



# RELATIVE RISK SITE EVALUATION



## Lincoln Air National Guard Base, Nebraska

### Introduction

The Department of Defense (DoD) identified certain per- and polyfluoroalkyl substances (PFAS) as emerging contaminants of concern which affected installations across the Air Force (when the term "Air Force" is used in this fact sheet, it includes Air National Guard [ANG]). Specifically, perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS) are components of legacy Aqueous Film Forming Foam (AFFF) that the Air Force began using in the 1970s as a firefighting agent to extinguish petroleum fires. The U.S. Environmental Protection Agency (EPA) issued lifetime drinking water Health Advisories (HA) for PFOS and PFOA, and health-based regional screening levels for PFBS.

The Air Force has systematically evaluated potential AFFF releases on all Installations and former Installations. It began with the Preliminary Assessments, or PAs, that identified potential release areas. First responders, fire chiefs, and hangar staff were interviewed to determine where a release or a spill may have occurred on an Installation (for example, aircraft crash site or an accidental hangar AFFF release). Once the information in the PA was collected, Site Inspections, or SIs, were initiated to take soil and water samples and analyzed the media for PFAS compounds at the potential release areas. The intention of the SI was to determine if a release had occurred and to determine the impacts to soil and/or groundwater. The next step in the process is called the Relative Risk Site Evaluation, or RRSE, which is a tool used to sequence Sites/Installations to begin a Remedial Investigation, or RI. Air Force Installations are at the beginning of the more detailed investigative stage, the RI, to determine where action is needed and to identify remedial technologies.

The Lincoln Air National Guard Base (ANGB) PFAS PA and SI can be found at the Air Force Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Administrative Record (AR): <https://ar.afcec-cloud.af.mil/> Scroll to the bottom of the page and click on "Continue to site", then select Air National Guard (e.g., Active, ANG, BRAC), scroll down the Installation List and click on Lincoln Municipal Airport, NE, then enter the AR Number 474920 in the "AR #" field for the PA. For the SI, enter the AR Number 585749. Then click "Search" at the bottom of the page. Click on the spy glass to view the document.

More information on the Air Force response to PFOS and PFOA can be found at: <https://www.afcec.af.mil/WhatWeDo/Environment/Perfluorinated-Compounds/>

### Acronyms

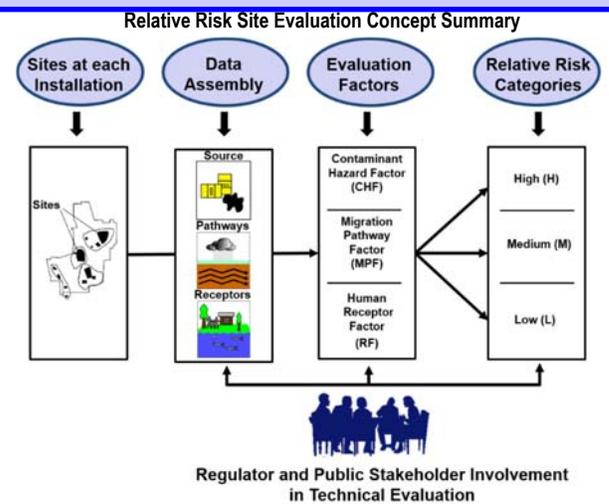
AFFF - Aqueous Film Forming Foam	NDEE - Nebraska Department of Environment and Energy
ANG - Air National Guard	PA – Preliminary Assessment
ANGB - Air National Guard Base	PFAS - Per-and polyfluoroalkyl substances
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act	PFBS – Perfluorobutanesulfonic acid
CHF – Contaminant Hazard Factor	PFOA - Perfluorooctanoic acid
DoD - Department of Defense	PFOS - Perfluorooctane sulfonate
EPA – US Environmental Protection Agency	PRL - Potential Release Location
HA – Health Advisory	RF – Receptor Factor
MPF – Migration Pathway Factor	RI – Remedial Investigation
	RRSE – Relative Risk Site Evaluation
	SI – Site Inspection
	USGS - U.S. Geological Survey

### Q. What is the Relative Risk Site Evaluation (RRSE)?

A. RRSE is a methodology to sequence environmental restoration work used by the DoD. The RRSE process is used to evaluate the relative risk posed by an environmental restoration site in relation to other sites. The DoD fundamental premise in site prioritization is "worst first," meaning the DoD Component shall address sites that pose a relatively greater potential risk to public safety, human health, or the environment before sites posing a lesser risk. Relative risk is not the sole factor in determining the sequence of environmental restoration work, but it is an important consideration in the priority setting process. The methodology is described in the DoD, Relative Risk Site Evaluation Primer, Summer 1997 Revised Edition: <https://denix.osd.mil/references/dod/policy-guidance/relative-risk-site-evaluation-primer/>

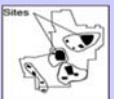
### Q. What is the RRSE framework?

A. The RRSE framework provides a DoD-wide approach for evaluating the relative risk to human health and the environment posed by contamination present at sites. The **Relative Risk Site Evaluation Concept Summary** (shown in the figure) illustrates the selection of sites, evaluation of the site data using three evaluation factors, and placement into high, medium, and low categories. The relative risk site evaluation framework is based on information fundamental to risk assessment: sources, pathways, and receptors to sequence restoration work. The RRSE is not a baseline risk assessment or health assessment in the CERCLA process. Regulators and public stakeholders in the environmental restoration process are provided the opportunity to participate in the process in accordance with the DoD Defense Environmental Restoration Program.



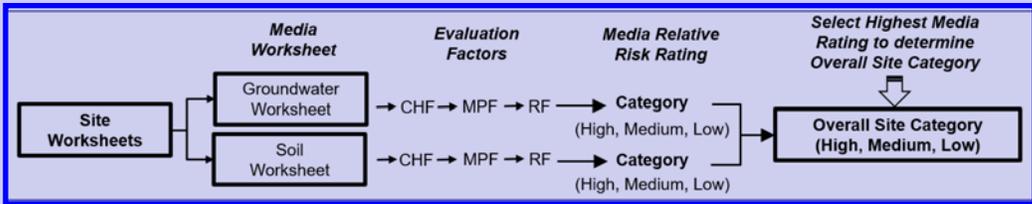
### Sites at Each Installation

#### Q. What restoration sites are required to be evaluated in the RRSE process?

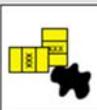


A. Restoration sites in CERCLA phases prior to remedy-in-place are evaluated in the process. Worksheets are developed for environmental media at each site. For consistency across all the Installations, only surface soil (0-1 foot deep) and groundwater media were evaluated in the RRSE.

The figure shows the process for a media to be evaluated using the contaminant hazard factor (CHF), the migration pathway factor (MPF), and the receptor factor (RF). Each media is scored to obtain a relative risk rating of High, Medium, or Low. The highest media rating determines the Overall Site Category.



#### Q. How is the Contaminant Hazard Factor (CHF) determined?



A. The CHF is determined by dividing the maximum level for a contaminant at each site by the approved screening values (i.e., comparison values). Contaminant concentration ratios are totaled to arrive at a CHF. A CHF sum of greater than 100 earns a **Significant (High)** ranking. **Moderate (Medium)** is when the total is 2 to 100. **Minimal (Low)** is when a CHF is less than two.

**FOR MORE INFORMATION**

Air Force Civil Engineer Center  
Environmental Restoration Program  
[www.afcec.af.mil](http://www.afcec.af.mil)

AFCEC CERCLA  
Administrative Record (AR)  
<https://ar.afcec-cloud.af.mil/>

#### Q. How is the Migration Pathway Factor (MPF) determined?

A. The movement of contamination at a site is evaluated and assigned a MPF rating. Ratings for MPFs are designated as: **evident**, **potential**, or **confined** (for High, Medium, and Low). **Evident** exposure means the contamination is at a point where exposure to humans or the environment can occur, such as at a drinking water well. **Potential** ratings are given to sites where exposure may happen. A **confined** rating is given to sites where a low possibility for exposure may occur.



**POINT OF CONTACT**

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#### Q. How is the Receptor Factor (RF) determined?

A. The RF is determined by a receptor's, such as humans, potential to come into contact with contaminated media. RFs are designated as: identified, potential, or limited (**High, Medium, and Low**). **Identified** rating is given when receptors are in contact or threat of contact with contaminated media. **Potential** is given when receptor may contact contaminated media. **Limited** is given when there is little or no contact with contaminated media.



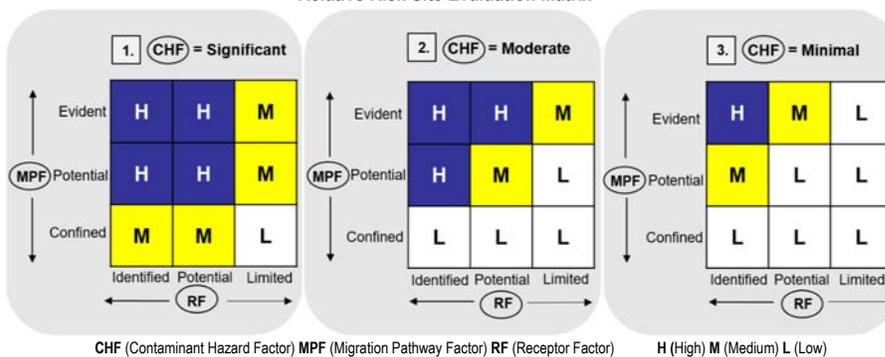
# RELATIVE RISK SITE EVALUATION, cont.

## Media Relative Risk Rating

**Q. How is the media relative risk rating determined?**

**A.** Use the chart to determine the relative risk rating for each media evaluated. Start by choosing the CHF result of the evaluation. If the CHF is **Significant**, use **box 1.**; if **Moderate**, use **box 2.**; if **Minimal**, use **box 3.** Then find the MPF and RF results and move to the square where the results meet. That square indicates the media relative risk rating. For example, if the CHF is **Significant** (go to **box 1.**), the MPF is **Potential** and the RF is **Identified**, then the rating is High (H).

## Relative Risk Site Evaluation Matrix



## Overall Site Category

**Q. How do I determine the Overall Site Category?**

**A.** The highest relative risk media rating becomes the **Overall Site Category** for the site. For example, if a site has a groundwater relative risk rating of **High**, and soil relative risk rating of **Low**, then the Overall Site Category rating for the site is **High**.

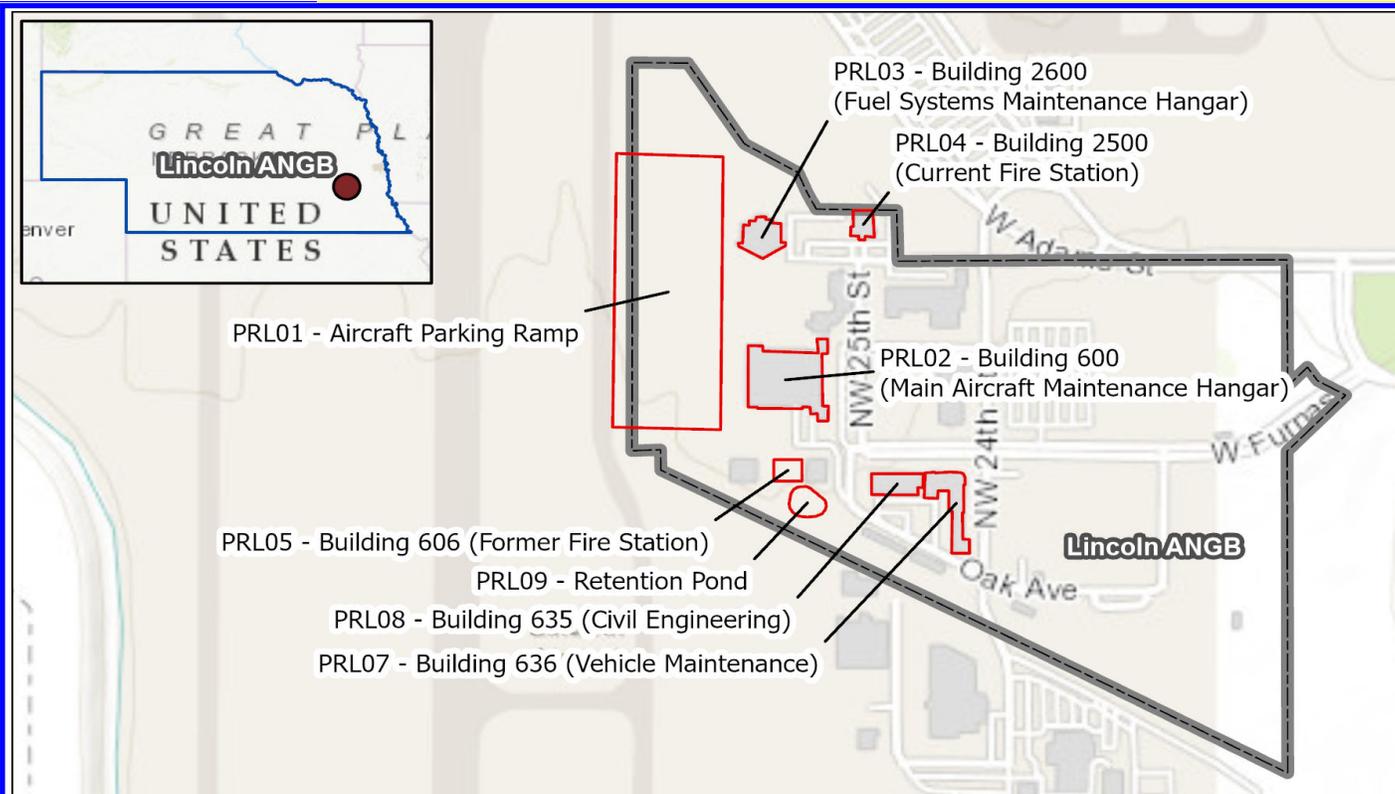
## Regulatory and Stakeholder Involvement

**Q. How do I participate as Stakeholder?**

**A.** To offer opportunity to participate in RRSE, the Air Force announces a public comment period in your local newspaper. There is also opportunity to participate during installation Restoration Advisory Committees where active. Installation Restoration Advisory Committee meetings are also announced in your local newspaper.

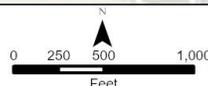
## Relative Risk Site Evaluation Summary Lincoln ANGB, NE

Overall Site Category	Site Name (Sites are shown on the map below and RRSE Worksheets are attached)
<b>HIGH</b>	PRL 2, PRL 3, PRL 4, PRL 5
<b>MEDIUM</b>	PRL 7, PRL 8, PRL 9
<b>LOW</b>	PRL 1



**Lincoln ANGB Relative Risk Site Evaluation (RRSE) Figure**  
National Guard Bureau  
Lincoln Air National Guard Base, Nebraska

**Legend**  
 AFFF Release Areas  
 Lincoln ANGB Installation Boundary



**National Guard Bureau/A4VR Environmental Restoration**  
3500 Fetchet Ave  
Joint Base Andrews, MD 20762

### Site Background Information

<b>Installation:</b>	Lincoln ANGB	<b>Date:</b>	06/08/2022
<b>Location (State):</b>	Nebraska	<b>Media Evaluated:</b>	Groundwater, Soil
<b>Site Name and ID:</b>	PRL 1 - Aircraft Parking Ramp	<b>Phase of Execution (e.g., RI, Record of Decision)</b>	N/A
<b>RPM's Name:</b>	Jenna Laube	<b>Agreement Status (e.g., Federal Facility Agreement date)</b>	N/A
<b>OVERALL SITE CATEGORY: LOW</b>			

### Site Summary

<b>Brief Site Description:</b>	<p>PRL 1 consists of the Aircraft Parking Ramp along the northwestern Base boundary. The ramp is used for parking, fueling and de-fueling, deicing, and minor maintenance of aircraft. The concrete ramp is sloped toward storm drains on the ramp. The majority of the Aircraft Parking Ramp is located in Drainage Basin 1; however, a small portion of the ramp is also located in Drainage Basins 2, 4, and 5. Stormwater flow from Basin 1 passes through an oil/water separator (OWS) that was installed in the early 2000s before discharging to the Old Oak Creek Channel. According to Base personnel, no crashes or mishaps of DoD aircraft have occurred at the Base that have used aqueous film forming foam (AFFF). AFFF has been used on airport property for civilian aircraft mishaps.</p>
<b>Brief Description of Pathways:</b>	<p>Groundwater occurs in two aquifers at Lincoln ANGB: a shallow unconfined aquifer and a deep confined aquifer. The unconfined aquifer is found within the unconsolidated sands and clayey soil formed during the Quaternary that extend to a depth of 90 feet (ft.) below ground surface (BGS) in some places. The shallow aquifer is generally encountered at approximately 12 ft. BGS with a saturated thickness of approximately 40 ft. and flows southwest toward Oak Creek. The unconfined and confined aquifers are separated by a thick silty clay layer. The deep confined aquifer occurs within the Cretaceous Dakota Formation and serves as the principal aquifer in the area, although not the primary source of drinking water due to its variable quality and transmissivity. The aquifer begins at depths between 125 and 150 ft. BGS and ranges in thickness from 0 to 350 ft. Regional flow is generally south-southwest, and average transmissivity is estimated at 4,000 gallons per day but can be as high as 50,000 gallons per day. According to State Regulators, numerous private wells were identified within a 2-mile radius of the base. Nebraska Department of Environment and Energy (NDEE) is working with the Lincoln/Lancaster County Health Department to assess possible impacts by identifying both registered and non-registered private wells in the downgradient groundwater flow direction which should be tested for possible PFAS contamination. Off-site investigation was not conducted as part of the ANG directed PA or SI. PRL 1 is a paved parking ramp.</p>
<b>Brief Description of Receptors:</b>	<p>No registered drinking water wells are found within a one mile radius of Lincoln ANGB; however, several groundwater monitoring wells are located onsite and a U.S. Geological Survey (USGS) study well is nearby. These wells are not used for potable water. According to Base personnel, no drinking water wells are located at the Base. Potable water is supplied by the city of Lincoln's water supply system, which obtains its source water from the Platte River Valley approximately 25 miles northeast of Lincoln. The groundwater information collected from monitoring wells during the Leidos SI field activities confirmed a south-southwest flow of shallow groundwater. There are residential areas within 4 miles downgradient of the base, and the presence of drinking water wells within this larger radius is not discussed in the site inspection (SI).</p> <p>PRL 1 is located adjacent to the runway and is only accessible to base personnel.</p>

# Groundwater Worksheet

Installation Lincoln ANGB

Site ID: PRL 1

AFFF Release Area #: AFFF 1

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOA	0.036	0.04	0.9
PFBS	0.014	0.602	0.0
<b>CHF Scale</b>	<b>CHF Value</b>	<b>Contamination Hazard Factor (CHF)</b>	<b>0.9</b>
CHF > 100	<b>H (High)</b>	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	<b>M (Medium)</b>		
2 > CHF	<b>L (Low)</b>		
CHF Value	<b>CHF VALUE</b>		<b>L</b>
<b><u>Migratory Pathway Factor</u></b>			
<b>Evident</b>	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		
<b>Potential</b>	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined		
<b>Confined</b>	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)		L
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<b><u>Receptor Factor</u></b>			
<b>Identified</b>	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		
<b>Potential</b>	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)		M
<b>Limited</b>	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)		
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<b>Groundwater Category</b>			<b>LOW</b>

# Soil Worksheet

Installation Lincoln ANGB

Site ID: PRL 1

AFFF Release Area #: AFFF 1

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.01	0.126	0.1
PFOA	0.00072	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.1
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value	<b>CHF VALUE</b>		<b>L</b>
<u>Migratory Pathway Factor</u>			
<b>Evident</b>	Analytical data or observable evidence that contamination is present at a point of exposure		
<b>Potential</b>	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined		
<b>Confined</b>	Low possibility for contamination to be present at or migrate to a point of exposure		L
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<u>Receptor Factor</u>			
<b>Identified</b>	Receptors identified that have access to contaminated soil		
<b>Potential</b>	Potential for receptors to have access to contaminated soil		
<b>Limited</b>	No potential for receptors to have access to contaminated soil		L
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<b>Soil Category</b>			<b>LOW</b>

### Site Background Information

<b>Installation:</b>	Lincoln ANGB	<b>Date:</b>	06/08/2022
<b>Location (State):</b>	Nebraska	<b>Media Evaluated:</b>	Groundwater, Soil
<b>Site Name and ID:</b>	PRL 2 - Main Aircraft Maintenance Hangar Building 600	<b>Phase of Execution (e.g., RI, Record of Decision)</b>	N/A
<b>RPM's Name:</b>	Jenna Laube	<b>Agreement Status (e.g., Federal Facility Agreement date)</b>	N/A
<b>OVERALL SITE CATEGORY: HIGH</b>			

### Site Summary

<b>Brief Site Description:</b>	<p>PRL 2 consists of Building 600, the Main Aircraft Maintenance Hangar (MAMH). This hangar was built in 1956 and is located on the western portion of the ANGB. An AFFF fire suppression system (FSS) was installed around 1997 during a renovation of the hangar. According to Base personnel, the AFFF was stored in a 2,000-gal tank located in a mechanical room within the hangar. The hangar's storm and sanitary piping was re-routed and an oil water separator (OWS) was installed to the east of the hangar as part of the renovation. The underwing FSS was tested annually and the AFFF was pushed into the floor drains. The hangar had one known release of AFFF in the late-1990s from a false indication of the alarm system. Base personnel estimate that approximately 200 gal of 3% AFFF solution were released into the hangar. All of the foam entered the floor drains and was contained in the former retention pond. No other known spills occurred at the Main Aircraft Maintenance Hangar. The hangar was retrofitted with a high-expansion foam (HEF) system in approximately 2009.</p>
<b>Brief Description of Pathways:</b>	<p>Groundwater occurs in two aquifers at Lincoln ANGB: a shallow unconfined aquifer and a deep confined aquifer. The unconfined aquifer is found within the unconsolidated sands and clayey soil formed during the Quaternary that extend to a depth of 90 feet (ft.) below ground surface (BGS) in some places. The shallow aquifer is generally encountered at approximately 12 ft. BGS with a saturated thickness of approximately 40 ft. and flows southwest toward Oak Creek. The unconfined and confined aquifers are separated by a thick silty clay layer. The deep confined aquifer occurs within the Cretaceous Dakota Formation and serves as the principal aquifer in the area, although not the primary source of drinking water due to its variable quality and transmissivity. The aquifer begins at depths between 125 and 150 ft. BGS and ranges in thickness from 0 to 350 ft. Regional flow is generally south-southwest, and average transmissivity is estimated at 4,000 gallons per day but can be as high as 50,000 gallons per day. According to State Regulators, numerous private wells were identified within a 2-mile radius of the base. NDEE is working with the Lincoln/Lancaster County Health Department to assess possible impacts by identifying both registered and non-registered private wells in the downgradient groundwater flow direction which should be tested for possible PFAS contamination. Off-site investigation was not conducted as part of the ANG directed PA or SI. PRL 2 is a mostly paved area.</p>
<b>Brief Description of Receptors:</b>	<p>No registered drinking water wells are found within a one mile radius of Lincoln ANGB; however, several groundwater monitoring wells are located onsite and a USGS study well is nearby. These wells are not used for potable water. According to Base personnel, no drinking water wells are located at the Base. Potable water is supplied by the city of Lincoln's water supply system, which obtains its source water from the Platte River Valley approximately 25 miles northeast of Lincoln. The groundwater information collected from monitoring wells during the Leidos SI field activities confirmed a south-southwest flow of shallow groundwater. There are residential areas within 4 miles downgradient of the base, and the presence of drinking water wells within this larger radius is not discussed in the SI.</p> <p>PRL 2 is within the base boundaries would be accessible to base personnel and escorted visitors.</p>

# Groundwater Worksheet

Installation Lincoln ANGB

Site ID: PRL 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOA	1.7	0.04	42.5
PFOS	13	0.04	325.0
PFBS	2.1	0.602	3.5

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	371.0
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CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$
100 > CHF > 2	M (Medium)	
2 > CHF	L (Low)	

CHF Value	<b>CHF VALUE</b>	<b>H</b>
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### Migratory Pathway Factor

<b>Evident</b>	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
<b>Potential</b>	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
<b>Confined</b>	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

### Receptor Factor

<b>Identified</b>	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	
<b>Potential</b>	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	M
<b>Limited</b>	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

### Groundwater Category

**HIGH**

# Soil Worksheet

Installation Lincoln ANGB

Site ID: PRL 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.014	0.126	0.1
PFOA	0.0024	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.1
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value	<b>CHF VALUE</b>		<b>L</b>
<u>Migratory Pathway Factor</u>			
<b>Evident</b>	Analytical data or observable evidence that contamination is present at a point of exposure		
<b>Potential</b>	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined		
<b>Confined</b>	Low possibility for contamination to be present at or migrate to a point of exposure		L
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<u>Receptor Factor</u>			
<b>Identified</b>	Receptors identified that have access to contaminated soil		
<b>Potential</b>	Potential for receptors to have access to contaminated soil		
<b>Limited</b>	No potential for receptors to have access to contaminated soil		L
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<b>Soil Category</b>			<b>LOW</b>

### Site Background Information

<b>Installation:</b>	Lincoln ANGB	<b>Date:</b>	06/08/2022
<b>Location (State):</b>	Nebraska	<b>Media Evaluated:</b>	Groundwater, Soil
<b>Site Name and ID:</b>	PRL 3 - Fuel Systems Maintenance Hangar Building 2600	<b>Phase of Execution (e.g., RI, Record of Decision)</b>	N/A
<b>RPM's Name:</b>	Jenna Laube	<b>Agreement Status (e.g., Federal Facility Agreement date)</b>	N/A
<b>OVERALL SITE CATEGORY: HIGH</b>			

### Site Summary

<b>Brief Site Description:</b>	<p>PRL 3 consists of Building 2600, the Fuel Systems Maintenance Hanger (FSMH). This hangar was built in 1994 with an underwing AFFF FSS and is located on the northwestern portion of the ANGB. AFFF was stored in a 2,000-gal tank located in a separate AFFF room within the hangar. The AFFF room has a man-made wood dike in front of the doors that lead to the apron as a result of previous AFFF leaks that reached the ramp and storm sewer and discharged to Outfall 003. A sanitary drain is located in the center of the room. Floor drains within the main portion of the FSMH were routed to the former retention pond. The underwing FSS was tested annually until 2015 and the AFFF was pushed into the floor drains. In 2015, the FSMH had a release of approximately 300 gal of 3% AFFF solution when a pipe from the FSS burst near the hangar door. The majority of the AFFF solution flowed to the hangar floor drains and former retention pond; however, some AFFF solution flowed onto the ramp and into a nearby storm drain, which discharged to Old Oak Creek Channel. Additionally, at least three occurrences of AFFF spills were documented in spill reports with the Nebraska Department of Environment and Energy. In October 1995, 2,000 gal of AFFF was released in the AFFF storage room due to a piping failure. In January 1996, 1,300 gal of AFFF was released in the AFFF storage room, also due to a piping failure. In February 1997, less than one pound of AFFF was released to the storm sewer during testing of the FSS. NDEE did not require any further action associated with these releases. Per policy, the FSS is being converted to a water suppression system. Mitigation measures are in place to ensure small leaks or drips in the hangar do not result in AFFF release to the environment in the near term.</p>
<b>Brief Description of Pathways:</b>	<p>Groundwater occurs in two aquifers at Lincoln ANGB: a shallow unconfined aquifer and a deep confined aquifer. The unconfined aquifer is found within the unconsolidated sands and clayey soil formed during the Quaternary that extend to a depth of 90 feet (ft.) below ground surface (BGS) in some places. The shallow aquifer is generally encountered at approximately 12 ft. BGS with a saturated thickness of approximately 40 ft. and flows southwest toward Oak Creek. The unconfined and confined aquifers are separated by a thick silty clay layer. The deep confined aquifer occurs within the Cretaceous Dakota Formation and serves as the principal aquifer in the area, although not the primary source of drinking water due to its variable quality and transmissivity. The aquifer begins at depths between 125 and 150 ft. BGS and ranges in thickness from 0 to 350 ft. Regional flow is generally south-southwest, and average transmissivity is estimated at 4,000 gallons per day but can be as high as 50,000 gallons per day. According to State Regulators, numerous private wells were identified within a 2-mile radius of the base. NDEE is working with the Lincoln/Lancaster County Health Department to assess possible impacts by identifying both registered and non-registered private wells in the downgradient groundwater flow direction which should be tested for possible PFAS contamination. Off-site investigation was not conducted as part of the ANG directed PA or SI. PRL 3 is an area that is mostly paved with adjacent exposed soils.</p>
<b>Brief Description of Receptors:</b>	<p>No registered drinking water wells are found within a one mile radius of Lincoln ANGB; however, several groundwater monitoring wells are located onsite and a USGS study well is nearby. These wells are not used for potable water. According to Base personnel, no drinking water wells are located at the Base. Potable water is supplied by the city of Lincoln's water supply system, which obtains its source water from the Platte River Valley approximately 25 miles northeast of Lincoln. The groundwater information collected from monitoring wells during the Leidos SI field activities confirmed a south-southwest flow of shallow groundwater. There are residential areas within 4 miles downgradient of the base, and the presence of drinking water wells within this larger radius is not discussed in the SI.</p> <p>PRL 3 is within the base boundaries between the aircraft parking area and the main hangar and would be accessible to base personnel.</p>

# Groundwater Worksheet

Installation Lincoln ANGB

Site ID: PRL 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	4.2	0.04	105.0
PFOA	0.19	0.04	4.7
PFBS	0.24	0.602	0.4
<b>CHF Scale</b>	<b>CHF Value</b>	<b>Contamination Hazard Factor (CHF)</b>	<b>110.1</b>
CHF > 100	<b>H (High)</b>	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	<b>M (Medium)</b>		
2 > CHF	<b>L (Low)</b>		
CHF Value	<b>CHF VALUE</b>		<b>H</b>
<b><u>Migratory Pathway Factor</u></b>			
<b>Evident</b>	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		
<b>Potential</b>	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined		M
<b>Confined</b>	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)		
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<b><u>Receptor Factor</u></b>			
<b>Identified</b>	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		
<b>Potential</b>	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)		M
<b>Limited</b>	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)		
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<b>Groundwater Category</b>			<b>HIGH</b>

# Soil Worksheet

Installation Lincoln ANGB

Site ID: PRL 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.16	0.126	1.3
PFOA	0.0013	0.126	0.0
PFBS	0.00091	1.9	0.0
<b>CHF Scale</b>	<b>CHF Value</b>	<b>Contamination Hazard Factor (CHF)</b>	<b>1.3</b>
CHF > 100	<b>H (High)</b>	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	<b>M (Medium)</b>		
2 > CHF	<b>L (Low)</b>		
CHF Value	<b>CHF VALUE</b>		<b>L</b>
<b><u>Migratory Pathway Factor</u></b>			
<b>Evident</b>	Analytical data or observable evidence that contamination is present at a point of exposure		
<b>Potential</b>	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined		
<b>Confined</b>	Low possibility for contamination to be present at or migrate to a point of exposure		L
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<b><u>Receptor Factor</u></b>			
<b>Identified</b>	Receptors identified that have access to contaminated soil		
<b>Potential</b>	Potential for receptors to have access to contaminated soil		
<b>Limited</b>	No potential for receptors to have access to contaminated soil		L
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<b>Soil Category</b>			<b>LOW</b>

### Site Background Information

<b>Installation:</b>	Lincoln ANGB	<b>Date:</b>	06/08/2022
<b>Location (State):</b>	Nebraska	<b>Media Evaluated:</b>	Groundwater, Soil
<b>Site Name and ID:</b>	PRL 4 - Current Fire Station Building 2500	<b>Phase of Execution (e.g., RI, Record of Decision)</b>	N/A
<b>RPM's Name:</b>	Jenna Laube	<b>Agreement Status (e.g., Federal Facility Agreement date)</b>	N/A
<b>OVERALL SITE CATEGORY: HIGH</b>			

### Site Summary

<b>Brief Site Description:</b>	<p>PRL 4 consists of Building 2500, the current Fire Station, built in 1995. The ANG Fire Department (FD) has served as the FD for the entire airport since 1995 and is located on the north boundary of the ANGB. The Current Fire Station houses AFFF in aircraft rescue and firefighting (ARFF) vehicles. Historically, the Base had two P-4 vehicles that carried 300 gal each of AFFF; one P-2 which carried 500 gal of AFFF; one P-12 vehicle, one P-22 vehicle, and one Army truck which carried 50 gal each of AFFF; and one foam trailer that carried 1,000 gal of AFFF. In addition, the Base has ARFF vehicles that did not store AFFF. When a new vehicle comes in, the AFFF is drained from an old vehicle and transferred to the foam trailer or to the new vehicle if that vehicle has foam storage. Current ARFF vehicles are usually filled by the AFFF trailers transfer pump into the vehicles. In the past minor spills or leaks of AFFF from ARFF vehicles would be allowed to dry in place. Large spills would have been stopped and cleaned up before entering into the building floor drains, which lead to an OWS prior to discharge to the sanitary sewer. Nozzle testing had been conducted annually on the West Ramp, located on Airport Authority property and draining to Old Oak Creek Channel at Outfall 005.</p>
<b>Brief Description of Pathways:</b>	<p>Groundwater occurs in two aquifers at Lincoln ANGB: a shallow unconfined aquifer and a deep confined aquifer. The unconfined aquifer is found within the unconsolidated sands and clayey soil formed during the Quaternary that extend to a depth of 90 feet (ft.) below ground surface (BGS) in some places. The shallow aquifer is generally encountered at approximately 12 ft. BGS with a saturated thickness of approximately 40 ft. and flows southwest toward Oak Creek. The unconfined and confined aquifers are separated by a thick silty clay layer. The deep confined aquifer occurs within the Cretaceous Dakota Formation and serves as the principal aquifer in the area, although not the primary source of drinking water due to its variable quality and transmissivity. The aquifer begins at depths between 125 and 150 ft. BGS and ranges in thickness from 0 to 350 ft. Regional flow is generally south-southwest, and average transmissivity is estimated at 4,000 gallons per day but can be as high as 50,000 gallons per day. According to State Regulators, numerous private wells were identified within a 2-mile radius of the base. NDEE is working with the Lincoln/Lancaster County Health Department to assess possible impacts by identifying both registered and non-registered private wells in the downgradient groundwater flow direction which should be tested for possible PFAS contamination. Off-site investigation was not conducted as part of the ANG directed PA or SI. PRL 4 is primarily paved with adjacent grassy areas.</p>
<b>Brief Description of Receptors:</b>	<p>No registered drinking water wells are found within a one mile radius of Lincoln ANGB; however, several groundwater monitoring wells are located onsite and a USGS study well is nearby. These wells are not used for potable water. According to Base personnel, no drinking water wells are located at the Base. Potable water is supplied by the city of Lincoln's water supply system, which obtains its source water from the Platte River Valley approximately 25 miles northeast of Lincoln. The groundwater information collected from monitoring wells during the Leidos SI field activities confirmed a south-southwest flow of shallow groundwater. There are residential areas within 4 miles downgradient of the base, and the presence of drinking water wells within this larger radius is not discussed in the SI.</p> <p>PRL 4 is the current fire station and would be accessed by fire station personnel and escorted visitors.</p>

# Groundwater Worksheet

Installation Lincoln ANGB

Site ID: PRL 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	13	0.04	325.0
PFOA	1.3	0.04	32.5
PFBS	1.5	0.602	2.5
<b>CHF Scale</b>	<b>CHF Value</b>	<b>Contamination Hazard Factor (CHF)</b>	<b>360.0</b>
CHF > 100	<b>H (High)</b>	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	<b>M (Medium)</b>		
2 > CHF	<b>L (Low)</b>		
CHF Value	<b>CHF VALUE</b>		<b>H</b>
<b><u>Migratory Pathway Factor</u></b>			
<b>Evident</b>	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		
<b>Potential</b>	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined		M
<b>Confined</b>	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)		
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<b><u>Receptor Factor</u></b>			
<b>Identified</b>	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		
<b>Potential</b>	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)		M
<b>Limited</b>	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)		
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<b>Groundwater Category</b>			<b>HIGH</b>

# Soil Worksheet

Installation: Lincoln ANGB

Site ID: PRL 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.052	0.126	0.4
PFOA	0.00076	0.126	0.0
PFBS	0.00033	1.9	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	<b>0.4</b>
CHF > 100	<b>H (High)</b>	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	<b>M (Medium)</b>		
2 > CHF	<b>L (Low)</b>		
CHF Value	<b>CHF VALUE</b>		<b>L</b>
<u>Migratory Pathway Factor</u>			
<b>Evident</b>	Analytical data or observable evidence that contamination is present at a point of exposure		
<b>Potential</b>	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined		
<b>Confined</b>	Low possibility for contamination to be present at or migrate to a point of exposure		L
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		<b>L</b>
<u>Receptor Factor</u>			
<b>Identified</b>	Receptors identified that have access to contaminated soil		
<b>Potential</b>	Potential for receptors to have access to contaminated soil		
<b>Limited</b>	No potential for receptors to have access to contaminated soil		L
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		<b>L</b>
<b>Soil Category</b>			<b>LOW</b>

### Site Background Information

<b>Installation:</b>	Lincoln ANGB	<b>Date:</b>	06/08/2022
<b>Location (State):</b>	Nebraska	<b>Media Evaluated:</b>	Groundwater, Soil
<b>Site Name and ID:</b>	PRL 5 - Former Fire Station Former Building 606	<b>Phase of Execution (e.g., RI, Record of Decision</b>	N/A
<b>RPM's Name:</b>	Jenna Laube	<b>Agreement Status (e.g., Federal Facility Agreement date</b>	N/A
<b>OVERALL SITE CATEGORY: HIGH</b>			

### Site Summary

<b>Brief Site Description:</b>	<p>PRL 5 consists of Building 606, the Former Fire Station. Building 606, located on the southwestern portion of the ANGB, was built in 1973 and demolished in 2000. Currently, the area is covered with grass. It served as the fire station for the Base from 1978 to 1995. According to Base personnel, AFFF was stored in ARFF vehicles, which were stored within the former Fire Station, including a 1,000-gal foam trailer. Containers of AFFF were stored at Base Supply, Building 651. ARFF vehicles were filled with AFFF using 5-gal buckets that were filled from the foam trailer. Drawings of the sanitary and storm sewers from 1983 indicate that the former fire station had no internal building drains and no storm drains were within the immediate vicinity of the building. Any leaks or spills of AFFF would have likely been left to dissipate.</p>
<b>Brief Description of Pathways:</b>	<p>Groundwater occurs in two aquifers at Lincoln ANGB: a shallow unconfined aquifer and a deep confined aquifer. The unconfined aquifer is found within the unconsolidated sands and clayey soil formed during the Quaternary that extend to a depth of 90 feet (ft.) below ground surface (BGS) in some places. The shallow aquifer is generally encountered at approximately 12 ft. BGS with a saturated thickness of approximately 40 ft. and flows southwest toward Oak Creek. The unconfined and confined aquifers are separated by a thick silty clay layer. The deep confined aquifer occurs within the Cretaceous Dakota Formation and serves as the principal aquifer in the area, although not the primary source of drinking water due to its variable quality and transmissivity. The aquifer begins at depths between 125 and 150 ft. BGS and ranges in thickness from 0 to 350 ft. Regional flow is generally south-southwest, and average transmissivity is estimated at 4,000 gallons per day but can be as high as 50,000 gallons per day. According to State Regulators, numerous private wells were identified within a 2-mile radius of the base. NDEE is working with the Lincoln/Lancaster County Health Department to assess possible impacts by identifying both registered and non-registered private wells in the downgradient groundwater flow direction which should be tested for possible PFAS contamination. Off-site investigation was not conducted as part of the ANG directed PA or SI. PRL 5 includes a grassy area with exposed soil.</p>
<b>Brief Description of Receptors:</b>	<p>No registered drinking water wells are found within a one mile radius of Lincoln ANGB; however, several groundwater monitoring wells are located onsite and a USGS study well is nearby. These wells are not used for potable water. According to Base personnel, no drinking water wells are located at the Base. Potable water is supplied by the city of Lincoln's water supply system, which obtains its source water from the Platte River Valley approximately 25 miles northeast of Lincoln. The groundwater information collected from monitoring wells during the Leidos SI field activities confirmed a south-southwest flow of shallow groundwater. There are residential areas within 4 miles downgradient of the base, and the presence of drinking water wells within this larger radius is not discussed in the SI.</p> <p>PRL 5 is within the base boundaries between the aircraft parking area and a drainage ditch.</p>

# Groundwater Worksheet

Installation Lincoln ANGB

Site ID: PRL 5

AFFF Release Area #: AFFF 5

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	1.5	0.04	37.5
PFOA	0.13	0.04	3.2
PFBS	0.19	0.602	0.3
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	<b>41.1</b>
CHF > 100	<b>H (High)</b>	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	<b>M (Medium)</b>		
2 > CHF	<b>L (Low)</b>		
CHF Value	<b>CHF VALUE</b>		<b>M</b>
<u>Migratory Pathway Factor</u>			
<b>Evident</b>	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		
<b>Potential</b>	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined		M
<b>Confined</b>	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)		
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<u>Receptor Factor</u>			
<b>Identified</b>	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		
<b>Potential</b>	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)		M
<b>Limited</b>	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)		
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<b>Groundwater Category</b>			<b>MEDIUM</b>

# Soil Worksheet

Installation Lincoln ANGB

Site ID: PRL 5

AFFF Release Area #: AFFF 5

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.77	0.126	6.1
PFOA	0.0027	0.126	0.0
PFBS	0.0013	1.9	0.0
<b>CHF Scale</b>	<b>CHF Value</b>	<b>Contamination Hazard Factor (CHF)</b>	<b>6.1</b>
CHF > 100	<b>H (High)</b>	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	<b>M (Medium)</b>		
2 > CHF	<b>L (Low)</b>		
CHF Value	<b>CHF VALUE</b>		<b>M</b>
<b><u>Migratory Pathway Factor</u></b>			
<b>Evident</b>	Analytical data or observable evidence that contamination is present at a point of exposure		H
<b>Potential</b>	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined		
<b>Confined</b>	Low possibility for contamination to be present at or migrate to a point of exposure		
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		H
<b><u>Receptor Factor</u></b>			
<b>Identified</b>	Receptors identified that have access to contaminated soil		
<b>Potential</b>	Potential for receptors to have access to contaminated soil		M
<b>Limited</b>	No potential for receptors to have access to contaminated soil		
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<b>Soil Category</b>			<b>HIGH</b>

### Site Background Information

<b>Installation:</b>	Lincoln ANGB	<b>Date:</b>	06/08/2022
<b>Location (State):</b>	Nebraska	<b>Media Evaluated:</b>	Groundwater, Soil
<b>Site Name and ID:</b>	PRL 7 - Vehicle Maintenance Building 636	<b>Phase of Execution (e.g., RI, Record of Decision)</b>	N/A
<b>RPM's Name:</b>	Jenna Laube	<b>Agreement Status (e.g., Federal Facility Agreement date)</b>	N/A
<b>OVERALL SITE CATEGORY: MEDIUM</b>			

### Site Summary

<b>Brief Site Description:</b>	<p>PRL 7 consists of Building 636, the Vehicle Maintenance Building constructed in 1999 in the southern area of the ANGB. Maintenance on the ARFF vehicles is conducted in a bay specifically for ARFF vehicles. In addition, the 1,500-gal foam trailer is often stored here. Vehicle Maintenance personnel indicate that they have not discharged or emptied any AFFF from an ARFF vehicle during maintenance activities, and no major AFFF spills have occurred. All floor drains in the Vehicle Maintenance building go to a pit within the building. The pit is pumped out and sent to the sanitary sewer.</p>
<b>Brief Description of Pathways:</b>	<p>Groundwater occurs in two aquifers at Lincoln ANGB: a shallow unconfined aquifer and a deep confined aquifer. The unconfined aquifer is found within the unconsolidated sands and clayey soil formed during the Quaternary that extend to a depth of 90 feet (ft.) below ground surface (BGS) in some places. The shallow aquifer is generally encountered at approximately 12 ft. BGS with a saturated thickness of approximately 40 ft. and flows southwest toward Oak Creek. The unconfined and confined aquifers are separated by a thick silty clay layer. The deep confined aquifer occurs within the Cretaceous Dakota Formation and serves as the principal aquifer in the area, although not the primary source of drinking water due to its variable quality and transmissivity. The aquifer begins at depths between 125 and 150 ft. BGS and ranges in thickness from 0 to 350 ft. Regional flow is generally south-southwest, and average transmissivity is estimated at 4,000 gallons per day but can be as high as 50,000 gallons per day. According to State Regulators, numerous private wells were identified within a 2-mile radius of the base. NDEE is working with the Lincoln/Lancaster County Health Department to assess possible impacts by identifying both registered and non-registered private wells in the downgradient groundwater flow direction which should be tested for possible PFAS contamination. Off-site investigation was not conducted as part of the ANG directed PA or SI. PRL 7 is a paved area behind the vehicle maintenance building. There is an isolated area of bare ground where the soil sample was collected.</p>
<b>Brief Description of Receptors:</b>	<p>No registered drinking water wells are found within a one mile radius of Lincoln ANGB; however, several groundwater monitoring wells are located onsite and a USGS study well is nearby. These wells are not used for potable water. According to Base personnel, no drinking water wells are located at the Base. Potable water is supplied by the city of Lincoln's water supply system, which obtains its source water from the Platte River Valley approximately 25 miles northeast of Lincoln. The groundwater information collected from monitoring wells during the Leidos SI field activities confirmed a south-southwest flow of shallow groundwater. There are residential areas within 4 miles downgradient of the base, and the presence of drinking water wells within this larger radius is not discussed in the SI.</p> <p>PRL 7 is within the base boundaries between the aircraft parking area and the active runway and would be accessible to base personnel.</p>

# Groundwater Worksheet

Installation Lincoln ANGB

Site ID: PRL 7

AFFF Release Area #: AFFF 7

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.64	0.04	16.0
PFOA	0.14	0.04	3.5
PFBS	0.26	0.602	0.4
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	19.9
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value	<b>CHF VALUE</b>		<b>M</b>
<u>Migratory Pathway Factor</u>			
<b>Evident</b>	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		
<b>Potential</b>	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined		M
<b>Confined</b>	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)		
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<u>Receptor Factor</u>			
<b>Identified</b>	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		
<b>Potential</b>	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)		M
<b>Limited</b>	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)		
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<b>Groundwater Category</b>			<b>MEDIUM</b>

# Soil Worksheet

Installation Lincoln ANGB

Site ID: PRL 7

AFFF Release Area #: AFFF 7

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0096	0.126	0.1
PFOA	0.00046	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.1
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value	<b>CHF VALUE</b>		<b>L</b>
<u>Migratory Pathway Factor</u>			
<b>Evident</b>	Analytical data or observable evidence that contamination is present at a point of exposure		
<b>Potential</b>	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined		
<b>Confined</b>	Low possibility for contamination to be present at or migrate to a point of exposure		L
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<u>Receptor Factor</u>			
<b>Identified</b>	Receptors identified that have access to contaminated soil		
<b>Potential</b>	Potential for receptors to have access to contaminated soil		
<b>Limited</b>	No potential for receptors to have access to contaminated soil		L
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<b>Soil Category</b>			<b>LOW</b>

### Site Background Information

<b>Installation:</b>	Lincoln ANGB	<b>Date:</b>	06/08/2022
<b>Location (State):</b>	Nebraska	<b>Media Evaluated:</b>	Groundwater, Soil
<b>Site Name and ID:</b>	PRL 8 - Civil Engineering Building 635	<b>Phase of Execution (e.g., RI, Record of Decision)</b>	N/A
<b>RPM's Name:</b>	Jenna Laube	<b>Agreement Status (e.g., Federal Facility Agreement date)</b>	N/A
<b>OVERALL SITE CATEGORY: MEDIUM</b>			

### Site Summary

<b>Brief Site Description:</b>	<p>PRL 8 consists of Building 635, the Civil Engineering Building constructed in 1959 in the southern area of the ANGB. From 1979 to 1999, the building served as both Civil Engineering and Vehicle Maintenance. Vehicle Maintenance moved to Building 636 when that building was constructed in 1999. The eastern end of Building 635 had a vehicle maintenance bay with a pit that discharged to a 4-in. sanitary sewer on the northern side of the building. The pit was relocated in 1999 during the remodel to another location in the building for the grounds equipment shop. According to Base personnel, no known spills of AFFF have occurred in the former Vehicle Maintenance facility.</p>
<b>Brief Description of Pathways:</b>	<p>Groundwater occurs in two aquifers at Lincoln ANGB: a shallow unconfined aquifer and a deep confined aquifer. The unconfined aquifer is found within the unconsolidated sands and clayey soil formed during the Quaternary that extend to a depth of 90 feet (ft.) below ground surface (BGS) in some places. The shallow aquifer is generally encountered at approximately 12 ft. BGS with a saturated thickness of approximately 40 ft. and flows southwest toward Oak Creek. The unconfined and confined aquifers are separated by a thick silty clay layer. The deep confined aquifer occurs within the Cretaceous Dakota Formation and serves as the principal aquifer in the area, although not the primary source of drinking water due to its variable quality and transmissivity. The aquifer begins at depths between 125 and 150 ft. BGS and ranges in thickness from 0 to 350 ft. Regional flow is generally south-southwest, and average transmissivity is estimated at 4,000 gallons per day but can be as high as 50,000 gallons per day. According to State Regulators, numerous private wells were identified within a 2-mile radius of the base. NDEE is working with the Lincoln/Lancaster County Health Department to assess possible impacts by identifying both registered and non-registered private wells in the downgradient groundwater flow direction which should be tested for possible PFAS contamination. Off-site investigation was not conducted as part of the ANG directed PA or SI. PRL 8 includes a building though soil samples were collected from a grassy adjacent area.</p>
<b>Brief Description of Receptors:</b>	<p>No registered drinking water wells are found within a one mile radius of Lincoln ANGB; however, several groundwater monitoring wells are located onsite and a USGS study well is nearby. These wells are not used for potable water. According to Base personnel, no drinking water wells are located at the Base. Potable water is supplied by the city of Lincoln's water supply system, which obtains its source water from the Platte River Valley approximately 25 miles northeast of Lincoln. The groundwater information collected from monitoring wells during the Leidos SI field activities confirmed a south-southwest flow of shallow groundwater. There are residential areas within 4 miles downgradient of the base, and the presence of drinking water wells within this larger radius is not discussed in the SI.</p> <p>PRL 8 is within the base boundaries at the building entrance and would be accessible to base personnel and visitors to the civil engineering building.</p>

# Groundwater Worksheet

Installation Lincoln ANGB

Site ID: PRL 8

AFFF Release Area #: AFFF 8

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.88	0.04	22.0
PFOA	0.41	0.04	10.2
PFBS	1.1	0.602	1.8

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	<b>34.1</b>
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CHF > 100	<b>H (High)</b>	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$
100 > CHF > 2	<b>M (Medium)</b>	
2 > CHF	<b>L (Low)</b>	

CHF Value	<b>CHF VALUE</b>	<b>M</b>
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### Migratory Pathway Factor

<b>Evident</b>	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
<b>Potential</b>	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
<b>Confined</b>	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

### Receptor Factor

<b>Identified</b>	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	
<b>Potential</b>	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	M
<b>Limited</b>	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

### **Groundwater Category**

**MEDIUM**

# Soil Worksheet

Installation Lincoln ANGB

Site ID: PRL 8

AFFF Release Area #: AFFF 8

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.014	0.126	0.1
PFOA	0.00069	0.126	0.0
PFBS	0.00015	1.9	0.0
<b>CHF Scale</b>	<b>CHF Value</b>	<b>Contamination Hazard Factor (CHF)</b>	<b>0.1</b>
CHF > 100	<b>H (High)</b>	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	<b>M (Medium)</b>		
2 > CHF	<b>L (Low)</b>		
CHF Value	<b>CHF VALUE</b>		<b>L</b>
<b><u>Migratory Pathway Factor</u></b>			
<b>Evident</b>	Analytical data or observable evidence that contamination is present at a point of exposure		
<b>Potential</b>	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined		
<b>Confined</b>	Low possibility for contamination to be present at or migrate to a point of exposure		L
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<b><u>Receptor Factor</u></b>			
<b>Identified</b>	Receptors identified that have access to contaminated soil		
<b>Potential</b>	Potential for receptors to have access to contaminated soil		
<b>Limited</b>	No potential for receptors to have access to contaminated soil		L
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<b>Soil Category</b>			<b>LOW</b>

### Site Background Information

<b>Installation:</b>	Lincoln ANGB	<b>Date:</b>	06/08/2022
<b>Location (State):</b>	Nebraska	<b>Media Evaluated:</b>	Groundwater, Soil
<b>Site Name and ID:</b>	PRL 9 - (Former) Retention Pond	<b>Phase of Execution (e.g., RI, Record of Decision)</b>	N/A
<b>RPM's Name:</b>	Jenna Laube	<b>Agreement Status (e.g., Federal Facility Agreement date)</b>	N/A
<b>OVERALL SITE CATEGORY: MEDIUM</b>			

### Site Summary

<b>Brief Site Description:</b>	<p>PRL 9 consists of a former retention pond. The pond was built at the same time as the FSMH (1994) to collect any liquids that entered the hangar floor drains. In 1997, the floor drains in the Main Aircraft Maintenance Hangar (MAMH) were rerouted to the retention pond during the renovation of that hangar. In the past, contaminated foam and foam from the MAMH was believed to have been placed in the pond. The retention pond had a rubber liner and diverter that allowed the pond water to drain to either the sanitary or storm systems. The valve operated under "normally closed" status. In the past, base personnel would call the city of Lincoln Waste Water Treatment Plant (WWTP) to let them know they needed to release foam to the WWTP. The practice was ceased in 2013 and no water was discharged from the retention pond to sanitary or storm systems.</p> <p>The former retention pond was closed in September of 2021. There were no liquids in the pond and the liner was in good shape during the closure. All of the contaminated soils, the piping connected to the pond, and the liner were removed. A Special Waste Permit was obtained from the Lincoln Lancaster County Health Department to dispose of the waste as special waste at the Lincoln Lancaster County Solid Waste Landfill. Clean soil was used to backfill the former retention pond. Concentrations shown in the worksheets are from data collected during the investigations that occurred years before the excavation.</p>
<b>Brief Description of Pathways:</b>	<p>Groundwater occurs in two aquifers at Lincoln ANGB: a shallow unconfined aquifer and a deep confined aquifer. The unconfined aquifer is found within the unconsolidated sands and clayey soil formed during the Quaternary that extend to a depth of 90 feet (ft.) below ground surface (BGS) in some places. The shallow aquifer is generally encountered at approximately 12 ft. BGS with a saturated thickness of approximately 40 ft. and flows southwest toward Oak Creek. The unconfined and confined aquifers are separated by a thick silty clay layer. The deep confined aquifer occurs within the Cretaceous Dakota Formation and serves as the principal aquifer in the area, although not the primary source of drinking water due to its variable quality and transmissivity. The aquifer begins at depths between 125 and 150 ft. BGS and ranges in thickness from 0 to 350 ft. Regional flow is generally south-southwest, and average transmissivity is estimated at 4,000 gallons per day but can be as high as 50,000 gallons per day. According to State Regulators, numerous private wells were identified within a 2-mile radius of the base. NDEE is working with the Lincoln/Lancaster County Health Department to assess possible impacts by identifying both registered and non-registered private wells in the downgradient groundwater flow direction which should be tested for possible PFAS contamination. Off-site investigation was not conducted as part of the ANG directed PA or SI. PRL 9 is in an open grassy area.</p>
<b>Brief Description of Receptors:</b>	<p>No registered drinking water wells are found within a one mile radius of Lincoln ANGB; however, several groundwater monitoring wells are located onsite and a USGS study well is nearby. These wells are not used for potable water. According to Base personnel, no drinking water wells are located at the Base. Potable water is supplied by the city of Lincoln's water supply system, which obtains its source water from the Platte River Valley approximately 25 miles northeast of Lincoln. The groundwater information collected from monitoring wells during the Leidos SI field activities confirmed a south-southwest flow of shallow groundwater. There are residential areas within 4 miles downgradient of the base, and the presence of drinking water wells within this larger radius is not discussed in the SI.</p> <p>PRL 9 is a former retention pond that is accessible to base personnel.</p>

# Groundwater Worksheet

Installation Lincoln ANGB

Site ID: PRL 9

AFFF Release Area #: AFFF 9

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOA	0.04	0.04	1.0
PFBS	0.98	0.602	1.6
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	<b>2.6</b>
CHF > 100	<b>H (High)</b>	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	<b>M (Medium)</b>		
2 > CHF	<b>L (Low)</b>		
CHF Value	<b>CHF VALUE</b>		<b>M</b>
<u>Migratory Pathway Factor</u>			
<b>Evident</b>	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)		
<b>Potential</b>	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined		M
<b>Confined</b>	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)		
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<u>Receptor Factor</u>			
<b>Identified</b>	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)		
<b>Potential</b>	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)		M
<b>Limited</b>	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)		
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
<b>Groundwater Category</b>			<b>MEDIUM</b>

# Soil Worksheet

Installation Lincoln ANGB

Site ID: PRL 9

AFFF Release Area #: AFFF 9

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0086	0.126	0.1
PFOA	0.00072	0.126	0.0
PFBS	0.00021	1.9	0.0
<b>CHF Scale</b>	<b>CHF Value</b>	<b>Contamination Hazard Factor (CHF)</b>	<b>0.1</b>
CHF > 100	<b>H (High)</b>	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	<b>M (Medium)</b>		
2 > CHF	<b>L (Low)</b>		
CHF Value	<b>CHF VALUE</b>		<b>L</b>
<b><u>Migratory Pathway Factor</u></b>			
<b>Evident</b>	Analytical data or observable evidence that contamination is present at a point of exposure		
<b>Potential</b>	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined		
<b>Confined</b>	Low possibility for contamination to be present at or migrate to a point of exposure		L
<b>Migratory Pathway Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<b><u>Receptor Factor</u></b>			
<b>Identified</b>	Receptors identified that have access to contaminated soil		
<b>Potential</b>	Potential for receptors to have access to contaminated soil		
<b>Limited</b>	No potential for receptors to have access to contaminated soil		L
<b>Receptor Factor</b>	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<b>Soil Category</b>			<b>LOW</b>